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MINIMUM ORDER QUANTITY IN CASE COMPANY

– Tools and Rules for Calculation

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Tämä opinnäytetyö on tehty toiminnallisen opinnäytetyön mallin mukaisesti ja se liittyy logistiikan kehitysprojektiin tausta yrityksen ”Customer Logistiikan” kehitysorganisaatiossa.

Opinnäytetyön tarkoituksena on kuvata kehitysprosessia liittyen minimitilausmäärän laskentamallin määrittämiseen, joka puolestaan johtaa tausta yrityksen myyntiyhtiöiden tilausprosessin käytön tehostamiseen. Työssä käsitellään myös niitä uuden työkalun kehittämiseen liittyviä vaatimuksia, jonka perusteella uusi työkalu voidaan luoda. Työkalun tarkoituksena on kerätä tietoa eri lähteistä, sekä rakentaa laskentakaava, jonka avulla minimitilausmäärä pystytään laskemaan automaattisesti.

Opinnäytetyössä kuvataan minimitilausmäärän tarkoitus ja sen vaikutuksia eri toimintoihin tausta yrityksessä. Myös taustayrityksen toimitus-, tilaus- ja laskutusprosessit kuvataan lyhyesti, jotta olisi helpompi ymmärtää kokonaiskuva sekä yrityksen tilaus- ja toimitusprosessien komlepksisuus.

Tulosten perusteella, ”Customer Logistiikan” kehitysorganisaatiossa voidaan jatkaa työkalun ja laskentamallien kehitystä, sekä aloittaa uusi kehitysprojekti, jossa mahdollisesti implementoidaan työkalu sekä laskentamalli taustayrityksen myyntiyhtiöiden käyttöön.

ASIASANAT:

Logistiikka, tilausprosessi, kehitysprojekti, laskentamalli, minimitilausmäärä

BACHELOR´S THESIS | ABSTRACT

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Minimum order quantity in Case Company

- Tools and rules for calculation

This thesis has been done based on applied thesis model. It has a background project within Customer logistics development organization at Case Company.

The purpose is to describe the development process for defining the minimum order quantity for case company sales companies' order processing. The ultimate target is to enhance the customer order processing.

This study also describes the requirements for developing a new tool for the calculation process. The purpose of the tool is to collect information from various sources and to build calculation macro. Based on this information and pre-defined rules the minimum order quantity can be calculated automatically.

Moreover, the purpose and usage of the minimum order quantity and its effects to different factors within case company are discussed. Case company delivery, order and invoicing processes are briefly explained, in order to have better understanding of the total picture and the complexity of case company ordering and distribution processes.

Based on the conclusions of this analysis, Customer Logistics solution may continue the development of the tool and rules for calculation and also start the development project, where the tool and rules will be implemented for case company sales company's use.

KEYWORDS:

Logistics, order process, development project, calculation rules, minimum order quantity

Abbreviations used in the document

Term	Definition
MOQ	Minimum order quantity in SAP R/3
DSNM	Demand Supply Network management organization
CLS	Customer logistics solutions, organization
IHL	Inventory holding location, illustrated as plant in SAP R/3
ERP	Enterprise recourse planning system; in Nokia SAP R/3
MTO	Make to order – process
PGI	Post goods issue, transaction in SAP R/3, that creates posting from inventory to cost of goods sold account
IC	Intercompany, transaction / invoice done between two legal entity within companies in SAP R/3
F&C	Finance and Control organizations
LSU	Local sales unit = sales company
P2P	Plant to plant, transaction between two plants; i.e. delivery from factory to IHL
MEA	Middle East and Africa sales unit
SEAP	South East Asia Pasific sales unit
Rosetta Net	Rosetta Net Standard, based on XML, enables System to system messaging with partners; i.e. Local service provider

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1 Introduction

This document is covering minimum order quantity (MOQ) calculation process, its problematic and proposed system solution for defining the optimal minimum order quantity and reflecting the defined quantity to SAP R/3 material master in Case Company. Case Company is Global company in manufacturing industry.

Document will also give short introduction about case company distribution models, as it is very important to understand the reasons, why the rules for minimum order quantity calculation are so important for case company.

Case Company has development organization within Customer Logistics and the Minimum order calculation process is part of one bigger development project. This study has been created based on the background project.

The background project started at the beginning of 2010. The purpose of that project is to enhance customer order management and invoicing processes with minimal IT changes cost efficiently. In practice this means smaller project teams, faster implementation, less costs and better business benefit realization.

Purpose of the minimum order quantity calculation process scope item, was to find out and define the rules and possible new tools for calculating the most efficient minimum order quantity for customer ordering process.

Company has sales units all over the world and especially one in Middle East and Africa sales unit (MEA). They had already defined own solution for minimum order quantity calculation within their sales unit and that solution was used as benchmark case for this project. Solution defined by MEA sales unit will be described in more detailed in chapter 4.3.

Minimum order quantity calculation process is very important for the case company, as there is strong business case and proven facts from MEA sales unit related to cost savings within transportation costs with minimum order quantity calculation process.
MEA had already proven that they were able to save costs with their solution. By taking into consideration all facts and the assumption that, there is possibility to define certain rules for efficient minimum order quantity calculation process, the outcome of the project might have huge affect to order handling process, production process, packaging and transportation costs, by reducing the quantity of small customer orders with multiple delivery schedule line items and delivery dates by using the production capacity properly and by using the full capacity of the packaging materials.

In the next chapters there is a short introduction to case company, the distribution model used in case company, ERP used and what the minimum order quantity

2 Case company in brief

Case company is the pioneer within the wireless communication. Company is delivering equipments, solutions and services for communication networks. Case company head office is located in Espoo, Finland. Case company has R&D, production, sales and marketing activities around the world. Case company has factories all over the world and sales over to 160 countries. Case company is big global manufacturing company having own development organizations for logistics, marketing, finance and other purposes.

This thesis was done based on background project in case company customer logistics development organization and will be explained more detailed in the next chapters.

3 Distribution model for devices & accessories

Before going into the details how the MOQ should be calculated or is currently used, the enterprise recourse planning system (ERP) system used in case company need to be explained and also the case company distribution process for their products should be clarified briefly.

Case company is using currently SAP R/3 as their ERP, for managing their planning, production, ordering, distribution, invoicing and financial reporting. SAP R/3 is software produced by SAP AG. It is an enterprise-wide information system designed to coordinate all the resources, information, and activities needed to complete business processes such as order fulfillment and billing (http://en.wikipedia.org/wiki/SAP_R/3, 16.11.2010). “SAP R/3 is real time, logical system, consisting of a number of servers. A group of servers functioning as one system is called a logical system. The logical system is the highest node in SAP R/3’s organization.”(© SAP AG, INTSD-Integration from SD point of view training material, March 2001)

The corporate structure described in the picture below is an excellent example how SAP R/3 enterprise structure has been built. It is very important to understand the purpose of certain organizational elements, such as sales organization, plant or company code, before we can go further with the case company distribution and invoicing process description, because I am using these terms in the text.

The corporate structure modeled in SAP R/3 is hierarchical. The client is the top level; wich can include several company codes. Several plants and sales organizations can be linked to company code and a plant can include various storage locations. A sales organization groups together any combination of plants. The assignment of plant to sales organization is not unique, that is, a sales organization may sell several plants and plant may supply materials to several sales organizations. However, a sales organization is always assigned to one company code (© SAP AG, INTSD-Integration from SD point of view training material, March 2001). These elements together with company taxation

strategy, causes need to use intercompany invoicing within customer delivery process. This will be covered in more details in the next coming chapters.

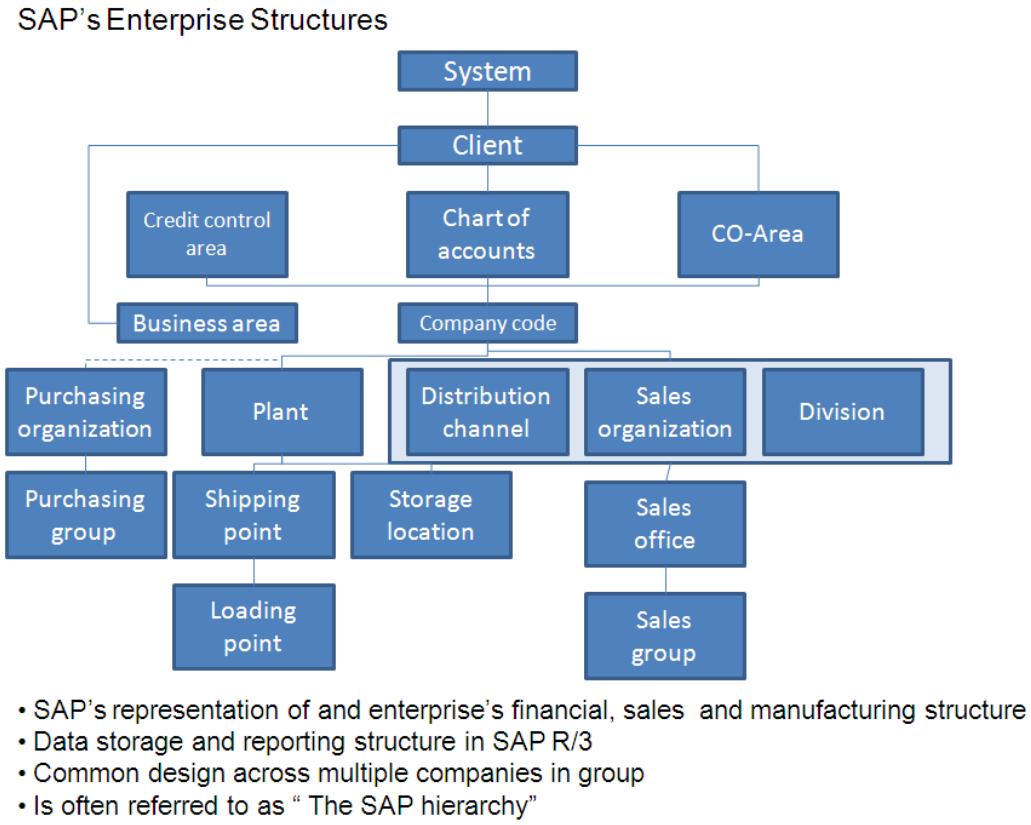

Figure 1: SAP's Enterprise Structures (SAP AG ©, INTSD- integration from an SD point of view training material, March 2001)

There is one common client used in case company that ties up all the transactions to the mother company. Each company has own company code, but all companies are using one global chart of accounts. There might be however local accounts mapped to the global accounts, due to local legal requirements such as statutory reporting in countries.

Case company has few different ways of delivering materials to customers. There are direct factory deliveries and deliveries via inventory holding location (IHL) to customers. Factories are illustrated in the SAP R/3 enterprise structure as plants. IHL is also illustrated as plant; it is plant without any production activities. In the next chapter I will explain the direct factory delivery concept used in case company.

3.1 Direct factory delivery

Case company has few factories all over the world. Case company has sales in over 160 countries and sales companies in over 60 countries. Almost all factories can deliver products to all countries. In practice that means that certain sales company sales organization is linked to the factory plant in SAP R/3. If the link does not exist, sales order creation is impossible in SAP R/3.

Customer delivery process starts from customer order. Based on customer order a sales order will be created. There are different ways of receiving customer orders to case company. Majority of the case company end customer orders are created Online, wich is a tool for customers where they place their orders, track deliveries, check and download their invoices via internet access.

Customer order can also be created with so called System to System (S2S) message, replicated directly from customers own ERP environment to case company SAP R/3 via EDI or Rosetta Net messaging.

Customer order can also be received via Fax, email or phone and entered manually directly in SAP R/3 by Local sales unit logistics coordinator.

As stated already earlier in the document, case company is using SAP R/3 as their ERP environment; everything is linked to everything because SAP is integrated environment. Creation of the sales order in sales unit and the material code as well as other necessary details entered in the sales order, is pointing to the factory, where production and delivery against the sales order will be later made. After sales order is saved and confirmed, it will be visible in the production as production order.

Case company is not producing products into inventory in general, but is using so called make to order process (MTO concept) when producing products (http://en.wikipedia.org/wiki/Build_to_order). Process starts from the time when sales order is received from customer and will be entered into SAP R/3. Document flow in SAP R/3 demonstrated shortly in the below picture.

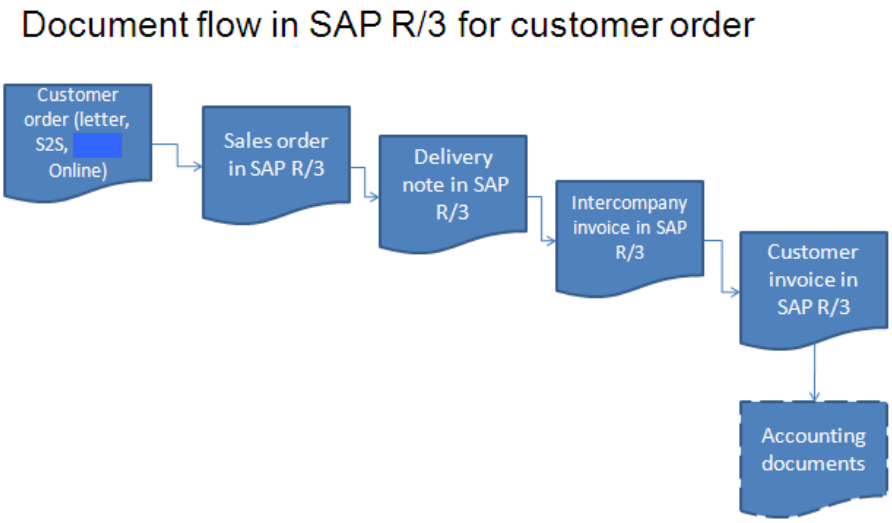

Figure 2: Document flow in SAP R/3 for customer order (A. Heikkilä, 16.11.2010)

First step in the process is to create sales order in SAP R/3. Sales order is created under sales company sales organization and product entered into the sales order, will define the production plant. In some cases there might be several factories producing same product at the same time and in these kinds of cases factory will be determined based on planning tool.

Before production can start, sales order need to get confirmation. Sales order is confirmed against plan and also customer credit limit will be checked during the order creation. Unconfirmed and credit blocked sales orders are not transferred to production.

When sales order is confirmed, production order will be created and production process can be started. After production process is completed, customer delivery can be created.

Invoicing can be done only after delivery has been created and posted away from inventory to cost of goods sold account, with post goods issue transaction in SAP R/3 (PGI). Delivery in SAP R/3 is physical document (delivery note), details in the document are used for the physical picking process in the

warehouse and document is also attached to pallets/ master cartons for the physical customer delivery.

As stated already, sales order is created by using sales organization code for local sales company. Local sales company can be independent company or company owned by the parent company. Factory can be also owned by parent company or it can be own legal entity. Depending on the owner of the factory, there can be either none or 1 to 2 intercompany invoices created due to taxation reasons for the customer deliveries. The parent company for case company is located in Finland. In SAP this is illustrated as company code.

The parent company in big corporations is basically collecting all profits and bearing also the losses for the whole corporation. (http://en.wikipedia.org/wiki/Parent_company). Parent company is also publishing the group accounts, by collecting the results from sales companies (http://moneyterms.co.uk/parent-company/). In case company this is done in official Financial System (FS), wich is the legal reporting environment. In case company the profits and losses are managed via automatic intercompany invoicing process and with transfer pricing policy, related to customer deliveries from factories. There are only few exceptional cases where this kind of intercompany invoicing is not applicable.

3.2 Delivery via Inventory holding location (IHL)

In some countries the direct factory delivery model is not applicable due to local reasons or restrictions. The concept for inventory holding location (IHL) is not automatically accepted in every country by case company management, but there need to be really heavy reasons why this kind of IHL would be opened to a country. This is due to the fact, that case company is using the make to order concept for producing products as was stated already in the previous chapter. company do not want to tie any capital into inventories, if this can be avoided.

Currently there are IHL locations in few countries i.e. in Eurasia. There are many reasons why IHL has been created to these spesific countries such as

difficult and slow customs clearance process & other legal activities in the border, wich might take from week to 3 weeks. During the transportation and customs clearance process time, finance and logistics are lacking visibility to the material in SAP R/3, unless there is IHL in country. In IHL process, materials in the customs clearance process are visible as goods in transit (GIT) and are posted to balance sheet in accounting. During the customs clearance process, products will be visible in the inventory as blocked stock in local warehouse in the country wich is illustrated as plant in SAP R/3.

Materials are delivered from factories to the IHL locations with so called Plant to Plant process (P2P). Sales order received from customer is triggering purchase order to factory. Factory is delivering products to IHL and invoicing is flowing according to the accounting concept depending of the owner of factory and IHL. After materials have been customs cleared, those are ready for customer deliveries locally.

3.3 Direct export (sales company under parent company)

In direct export sales mode, parent company takes care of customer sales order management, invoicing and incoming payment clearing operations. Sales to different countries or sales area can be managed under different sales organizations, but all the sales organization in direct export mode are linked to parent company company code in SAP R/3. These direct export sales organizations are however sales companies operated physically in countries, examples of direct export sales organization countries are i.e. MEA and SEAP. In these countries there are normally few persons working locally with connection to the customers, but not so many persons that the requirement for creating own sales company is fulfilled.

All end customer related transactions and corresponding profit & loss and balance sheet entries are reported for parent company.

In direct export deliveries there is only one or none Intercompany invoices. This is due to the fact that factory is both operated and owned by parent company or by manufacturing company for parent company.

3.4 Sales company (independent company)

In sales company sales mode, local sales company in a country takes care of customer sales order management, invoicing and incoming payment clearing operation. All end customer sales related transactions and corresponding profit & loss and balance sheet entries are reported for local sales company.

3.5 Conclusions to the fulfillment process

Based on the previous chapters, it is clear that the case company organizationd and fulfillment process is very complex. Factories, sales units and customers are located all over the world. The ERP setup and company structure used is complex. This means in practise that developing or changing current processes can be very difficult. Therefore it is very important to understand, how the processes are working in SAP R/3 and how the delivery pipelines are working.

Now the case company used ERP environment and fulfillment models are clarified in the case company, it is time to check that what does the minimum order quantity really mean and how and where it is currently used. These details will be covered in the next chapter.

4 Usage of minimum order quantity (MOQ)

Minimum order quantity = MOQ, is master data setting in SAP R/3. MOQ can be maintained on material level (in material master data) or it can also be maintained on customer/material level (in customer info record), this feature however is not used currently in case company.

When this kind of master data setting is maintained in SAP R/3, system is automatically proposing the defined MOQ from master data, when sales order is entered in SAP R/3. This information is however only proposal and user can

change the quantity to be whatever customer has ordered. Basically MOQ is and will be also agreed with customers in customer collaboration meetings, but systems should also propose the quantity according to the agreements with customers to avoid absurd quantities in the sales orders.

4.1 MOQ in material master

Currently MOQ is maintained behind material codes in SAP R/3 material master. This setting is sales organization level information and each sales unit has their own sales organization, wich makes this setting unique for each sales unit. Currently there are no rules for sales units that what kind of figures to enter as MOQ, and sometimes this causes absurd order quantities.

Below you can see screen shot from SAP R/3 material master, where the MOQ is maintained. There is possibility to enter Minimum order quantity and also minimum delivery quantity, but the delivery quantity is not used or at least not very widely.

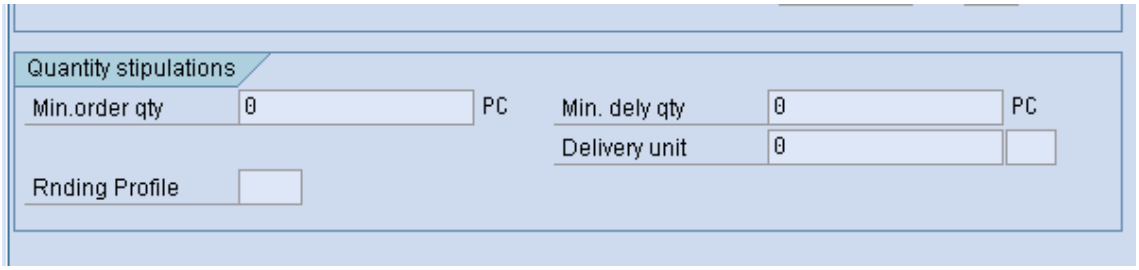

Figure 3: MOQ maintenance screen from SAP R/3 material master (A.Heikkilä 15.11.2010)

MOQ from SAP R/3 material master is replicated to Online via Rosetta Net messaging. When customer is entering the order Online, they will select the material code what they would like to order, enters total order quantity and based on settings in SAP R/3 material master they will get pop up screen about the proposed MOQ. Customer cannot change the QTY smaller, but they can change it bigger. There is not however any control for the qty compared to

packaging sizes in Online tool. This might cause the fact that half empty boxes or pallets would be sent to customers. This kind of ordering process is not effective from distribution and transportation costs point of view for case company or any company. This is something that needs to be taken into consideration when the new solution will be documented in the chapter 6.

4.2 MOQ in customer info record

There is also possibility to maintain customer/material info records in SAP R/3. Below you can see picture, where user can maintain MOQ as minimum delivery quantity. This kind of feature is currently not used in case company and as it is not used, the data entered is not affecting to any process. But the possibility to maintain this kind of data on customer level is very interesting. By changing or developing this feature further would give possibilities for the new development that is explained more detailed in chapter 6.

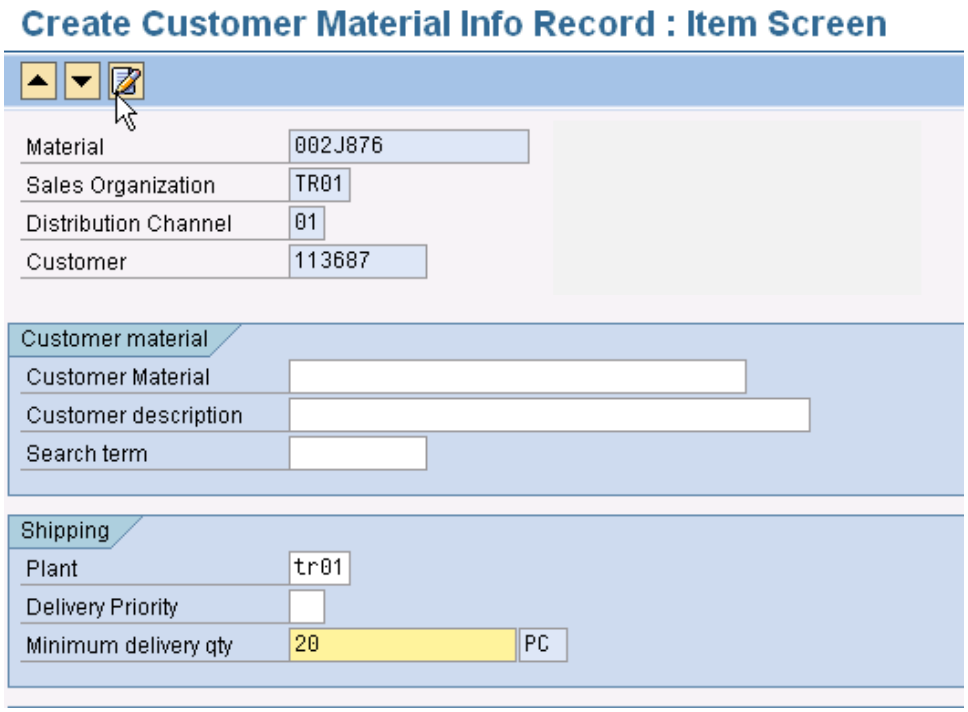

Figure 4: Customer /material info record maintenance in SAP R/3 (A.Heikkilä, 15.11.2010)

Based on questionnaire that was sent to Sales unit logistics managers on 27th of April 2010, in some countries there would be need to maintain the MOQ on customer/material level, as there might be cases, where certain customers are ordering bigger or smaller quantities. In this kind of case, it is not reasonable to use the MOQ maintained in material code level and this factor need to be taken into consideration, when documenting the final solution.

4.3 MOQ Definition for products in sales units

When this study for MOQ calculation process started, there was one sales unit used as benchmark case; MEA (Middle East and Africa sales unit). They had already created and implemented solution for MOQ calculation based on monetary values. Also some other sales units had done their own solutions for MOQ maintenance.

The MEA solution had 2 different key points when defining the optimal MOQ; monetary value and sales carton sizes.

1. **Selling target**: Sales unit calculated first, that what would be the monetary value for reasonable size order.
2. **Master carton sizes**: Quantity for mobile devices in master cartons in factories were considered within different price categories. There is not allways same amount of mobile devices within master cartons, but it differs within price category.

Based on this analysis MEA defined the MOQ for their sales unit materials. Below table is describing the details for product price categories and the proposed quantities for MOQ.

Table 1. MOQ definition in MEA

Product price	MOQ
< 100 USD	120 pc
100 - 300 USD	40 pc
300– 500 USD	20 pc
>500 USD	10 pc

During the study it was found that the sales unit in Brazil had also started their own actions related to the calculation of MOQ. They had copied the MEA way of working almost as such, but as you can see from the picture below, the product price categories and proposed MOQ's are differing from the MEA MOQ's. The reason for this is the different markets and customers.

Table 2. MOQ definition in Brazil

Product price	MOQ
< 100 USD	80 pc
100 - 199 USD	40 pc
200– 399 USD	20 pc
>400 USD	10 pc

Each sales unit and country has different customers and markets. In some countries there are big operators and they tend to buy normally bigger quantities than smaller customers in other countries, also the price range differs within different countries. For example there are countries that buy lower price products than other countries (developing countries for example). This makes the study very interesting and challenging at the same time, as the country and customer variations need to be taken into consideration.

4.4 MOQ definition for small products

MOQ is not used currently in case company for smaller products. Small products in case company are own product category, cheaper and smaller products. These products are typically very small, light and are sold in bigger slots compared to the other products. Master carton sizes in packaging area might be quite large compared to the materials packaged inside to the boxes and in this kind of cases; company is really paying from air in many times. MOQ

definition for bigger quantities compared to optimizing the master carton sizes would bring benefits for the company. Customers might be also willing to buy bigger quantities at the same time as the price for the small products are lower compared to the other products.

Smaller products revenue share compared to the revenues for the other cse company products is very small. MOQ calculation for small products is not in the scope of the background project phase 1 or phase 2, however based on the feedback I received from business this would be very important in the future. But as the share is so small, business owner does not see this as very important and therefore this was left out. But this will be anyway taken into consideration, when the final report is written to case company.

4.5 MOQ from factory & distribution point of view for products

Factories and the distribution process organizations are reviewing the MOQ from totally different point of view comparing to the sales units. What factories are seeking is optimizing the pallets sizes for customer deliveries.

Optimal situation is when customer order qty would be full pallet or half pallet depending on the order volume and customer agreement. Sometimes it can be also possible that the master cartons included into the pallet are not full. Some customers may approve also so called mixed pallets that include master cartons containing different products.

If customer does not approve mixed pallets and the pallet qty is not full, then case company is paying basically from free slots in trucks. Most of the cases case company is paying freight based on volume not by weight. Incase there are half/partial pallets or half master cartons in full pallets, it is basically weist of money related to transportation costs if there would be possibility to optimize the MOQ with customers. Different pallet types illustrated in the picture below.

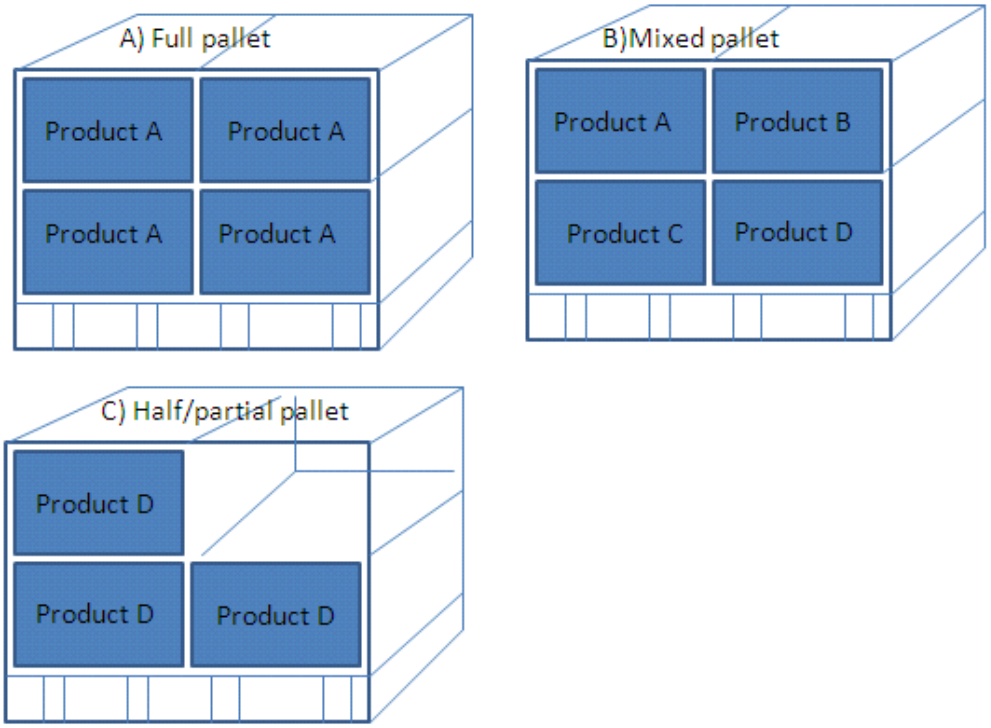

Figure 5: Different pallet types with master cartons from factories for customer deliveries (A. Heikkilä, 16.11.2010)

Some challenges there are also when trying to optimize the MOQ for master cartons /pallets. Quantity for products differs within master cartons, there are different sizes for sales packages. Also pallet sizes are differing, depending on the country variations, customer requirements and also due to transportation. Pallets in air transportation might be smaller than in truck deliveries and also there are country variances how to build the pallets, i.e. is there need for wooden boxes or carton hats etc. In the next chapter, the financial aspect of the MOQ will be clarified more detailed.

5 Financial aspect for the MOQ

What is the goal for the company? => To gain profit. How is the profit calculated? With simplified calculation procedure profit is calculated by reducing costs from the revenues. Revenues are coming from sales and can be seen in

P&L as Net sales figure (equals to the amount of the sales invoices for the customers). When direct costs are deducted from the sales revenues you can see the sales margin. Direct costs are costs that relates directly to the sales. Typically these costs are transportation costs, customs and duty costs. This is simplified way of calculating the real sales margin.

There is own Finance and control team for Customer logistics in case company. They are analyzing and following different measurements related to CLS operating costs. These kinds of costs are typically costs related to Customer logistics global functions and the costs for the sales unit operations and personnel. Global functions are for example development organization and HR. Sales unit operations and personnel costs are coming from the daily business operations. Order handling, planning and customer collaboration.

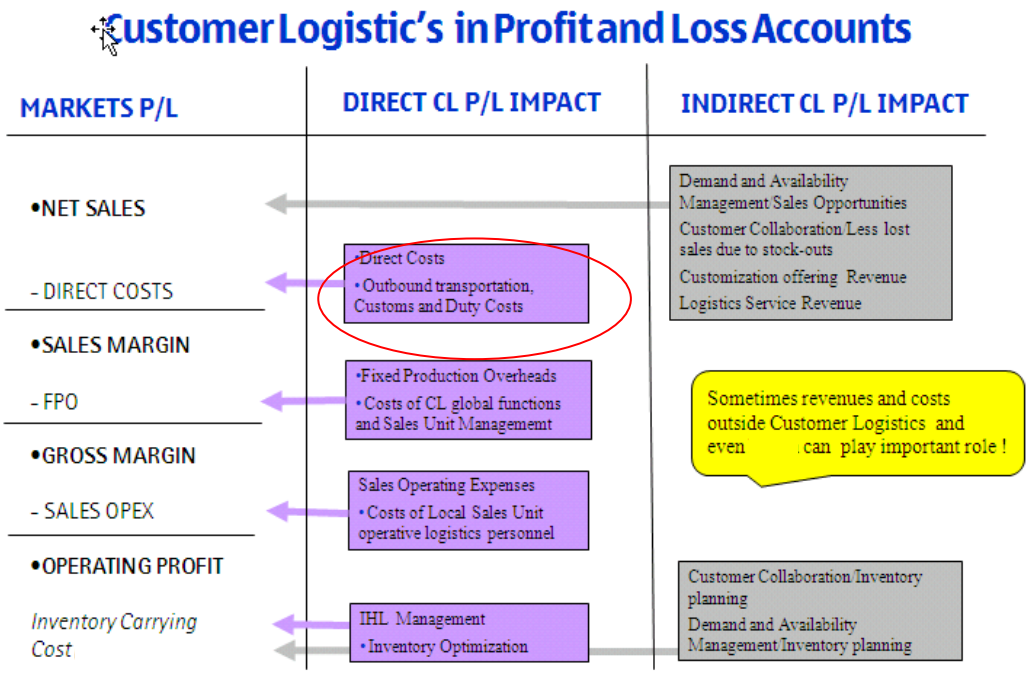

Figure 6: Customer logistics in P&L (case company financials10/09)

By reducing the direct costs related to the products, gross margin can be potentially being increased. How to do this in practice? A negotiation with Local Service Providers is one way and the other way is to enhance the delivery process. By maintaining certain rules for the packaging and ordering processes it could be possible to save costs related to customer deliveries.

5.1 CLS Scorecard

CLS F&C is monitoring more CLS productivity than product profitability in general as is done in other F&C units in case comapny. They have certain measurements in their financial scorecard, where they have set certain target %, and comparing the actual costs vs. net sales %, to see where they are. These are very important measures, as they are following these measurements all the time. They have few financial measurements and also process measurements that are very case company specific and are not really relevant for the MOQ study.

Financial	**Unit**		
Customer Logistics Productivity	%	Act	2
(% of Markets Net Sales)		Tgt.	20
Outbound Freight / Net Sales	%	Act.	4
Target STP		Tgt.	2
CL Inventory Carrying Cost/Net Sales	%	Act.	1,75
Target STP		Tgt.	1
Sales OPEX+FPO/Net Sales	%	Act.	1,3
Target STP		Tgt.	0.2

Figure 7: CLS financial scorecard measurements, (Act. and Tgt. Figures are not reflecting real life figures)

What CLS F&C is monitoring within their CLS financial scorecard, is mainly operating expenses compared to Net Sales. For example the percentage of outbound freight costs compared to net sales. If we think that there would be

potential savings related to freight costs, the savings should be quite easily be visible in CLS scorecard under outbound freight vs. net sales.

If we think about the MOQ calculation deployment and compare it to the CLS financial scorecard figures, we can basically see two measures where we can potentially affect by using MOQ.

1. Outbound freight compared to net sales
2. Sales opex + FPO compared to net sales

The affect to the outbound freight costs is basically direct affect from efficient packaging process and not paying from air within transportation to customers. There should be potential costs savings within transportation costs.

What kind of affect there could be to sales opex and FPO? The affect, if there is any, is costs savings for operational expenses (OPEX) in local sales units. The costs savings can be gained by enhancing the customer ordering process, by reducing the quantity of small orders and multiple schedule line items within the orders. This means in practice saving time for other activities, as manual work for order processing is reduced. How to do this then in practice? Solution proposal for the MOQ calculation process will be covered in the next chapter.

6 Solution proposal

Based on the analysis and benchmarking to already existing solutions, automation would be needed for defining the MOQ and entering it into the SAP R/3. By automating the calculation process, MOQ calculation would be easy and fast process to use and would not need huge manual maintenance work. If the usage would be easy, the MOQ would be used more in case company sales units. The solution however need to be more comprehensive than just automating the MOQ maintenance.

There need to be logic to take into consideration the different factors to the calculation, such as:

- Monetary value
- Packaging efficiency and distribution process
- Country specific rules (packages, customers, markets etc.)
- Production process

Based on the feedback that was received from case company sales units, author and project group, it was quite clear, that some kind of tool would be useful to do the job to save also the operative costs in factories and sales units.

The tool would get information from various sources and might be working in excel. The tool itself in excel would be calculating the MOQ data with macro by pre-defined rules. After macro calculation the output could be sent to SAP R/3 material master automatically or manually. Building the tool and automation would of course need IT development and project.

Below there is a flowchart presenting the different factors and information sources that are giving input and output for the calculation process. This is a draft blueprint that how could this process work in practice.

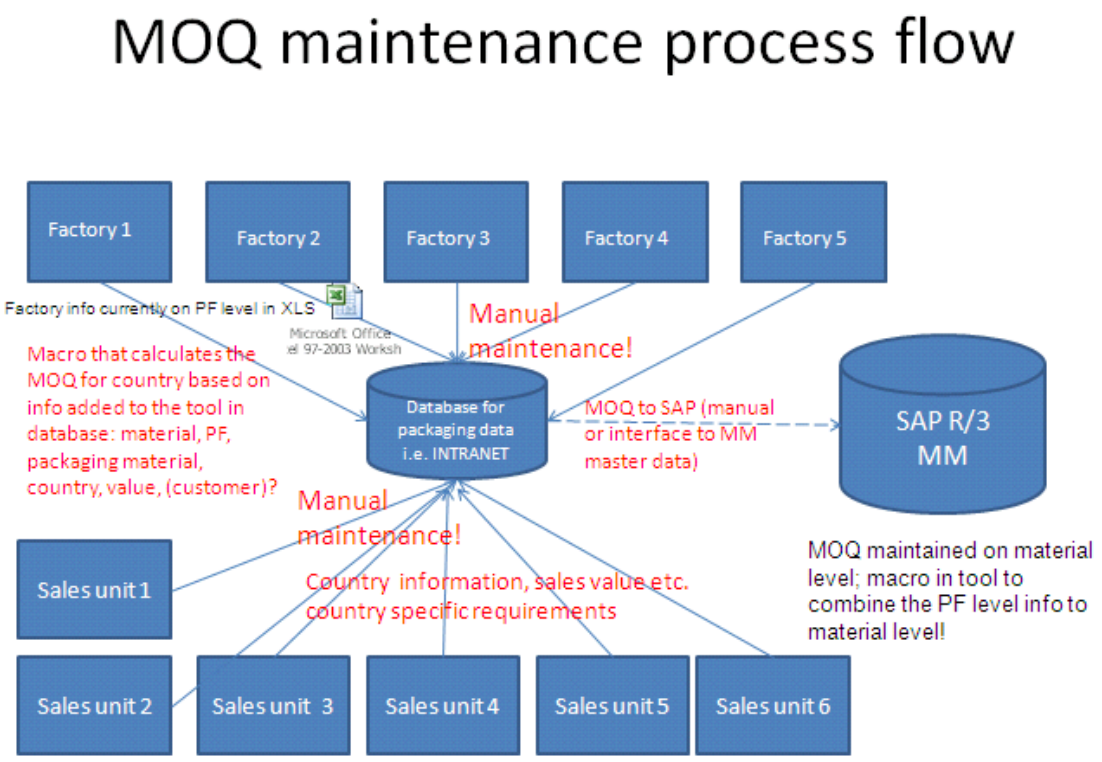

Figure 8: MOQ maintenance process flow (A. Heikkilä, 15.11.2010)

In the following chapters, will be explained shortly what kind of information is given from the different organizations that are crucial for the macro to work.

6.1 Logistics info Excel in factories

Factories are currently updating Excel file, containing logistics information related to packaging data for products. They are maintaining the packaging details per product model, for example product A, product B etc. The file is also including details for sales package quantities per master carton, master carton amount per pallet and proposed MOQ quantities. This Excel file could be used as basis for the new tool, as it is including the important information related to the packaging data. Currently there are several Excel files, prepared by each factory and are stored in various places.

In the future, if the tool would be built, the excel file maintenance could be done as today, but somebody from the factory would need to type those details into the new tool or they could replace the Excel files by the new tool totally as

otherwise it would been double maintenance for the responsible person in factory.

One minor change would be needed to the Excel files, and that is to replace the product model by product family code or by material code, depending on the solution from business, that in what kind of level the MOQ would be updated in the future.

Strong recommendation to the business owners is that this Excel data would be replaced with the new tool. This way the information would be all the time up-to-date and visible to all factories on-line. Data would be still updated manually in the tool, as it is done today to the local Excel files.

6.2 Country specific information

Before the macro could be used in the new tool, the country specific information would be also needed in the tool, such as country specific packaging rules or materials, customer specific requirements, possible monetary values etc. This information would be also need to be maintained manually. Each sales unit would need to update the information as the MOQ setting is sales organization level information as was stated earlier in the document. In case there are no local restrictions or rules, the data could be left as blank.

6.3 MOQ macro in tool

After all necessary information and the rules are maintained in the tool, macro can be run. Based on the run, tool is proposing MOQ per product family/ per country/per maintained requirements (varies per sales unit). Running the Macro could be automated or manual task, but sales unit representative should anyway check and approve the results. If the results would be ok, they would be able to start the material master update process into SAP R/3. The update process could be automated and the update file could be triggered maybe by the sales unit representative person or this task could be also done manually in SAP R/3 material master as it is done today.

6.4 Affect to current MOQ master data in SAP R/3

Currently MOQ is maintained in SAP R/3 on material code level. Based on the management decision on the new MOQ maintenance process, it can have affect to the current MOQ maintenance process. If the current way of working is kept, the affect is more in the factory Logistics information Excel or in the tool (depending on the business decision, as was mentioned in chapter 6.1), where they need to change the product model to be on material code or product family level. If the management agrees on the product family level MOQ maintenance, this would mean small changes into the Logistics information excel but also change in SAP R/3, as there would be needed new table to gather the MOQ data on sales organization level .

Building new table in SAP R/3 would have also affected to Online tool. Currently the MOQ is replicated from SAP R/3 material master, but in the future it would be replicated from the new table.

Also one thing that needs to be considered is the possibility to have the customer information available in the new table, or customer info record. But in this kind of case, there is needed new logic, when MOQ is replicated to Online tool, as the system should check if there is specific customer /material info record existing.

If there is information existing for the MOQ in different places, the new built logic for replication need to be built so, that the replicated data should be the record including more data. This is the basic logic used in SAP R/3 condition records.

Logic might be quite hard to run in SAP R/3, because it has to read the data from different places, therefore it might be easier to have the customer information also in the new table and the tool would maintain the info only into one location in SAP R/3, and it would be the new table. In practice it would mean that there could be lines like this, illustrated in the table below in the new SAP R/3 master data table for MOQ.

Table 3. Customer specific MOQ maintenance in SAP R/3 (A. Heikkilä, 15.11.2010)

Sales organization	Product / Product family	Description	Customer	MOQ
TR01	**123456/ S001AFG**	E75	Customer A	60
TR01	**123456/ S001AFG**	E75	-	20

6.5 System changes

To summarize the IT development needs and system changes shortly.

- **New tool** based on Excel would be built to intranet to gather the information for the MOQ calculation.
- **Excel macro** would be needed to be able to calculate the MOQ with given information in the tool.

Depending on the desired solution on the MOQ maintenance level (material or product family level) the changes are mainly in **Logistics information Excel** file or in the the **Excel and in SAP R/3**. If the management would select the maintenance on product family level, the change is bigger and development need is bigger.

- **New table** into SAP R/3 is needed, to gather the MOQ master data and the **logic to reflect** the MOQ to Online tool and to the sales orders.

This means development, programming and testing. In practice it means more work and costs in IT side, but at the same time, it actually reduces the amount

of MOQ master data lines in SAP R/3 and makes the managing the master data easier in the future.

7 Conclusions

The purpose of this document was to describe the concept for Minimum order quantity, how it is currently used and where and how it could be calculated efficiently by taking into consideration different point views such as packaging efficiency, monetary value, etc. Based on the study the calculation process for minimum order quantity is quite difficult.

The usage of minimum order quantity is easy, but the process how to calculate the minimum order quantity properly with global solution is challenging. Already at the beginning of this study, it was clear that the study would be including a plan to build a tool based on Excel to do the calculation work. This study does not cover the calculation rule how to do the calculation, but mostly concentrating to the different factors what need to be taken into consideration while calculating the minimum order quantity and what kind of affect this tool and calculation might have to SAP R/3. The calculation rule definition is something that needs to be done by Business, if and when this solution will be studied further by case company.

It is clear that, it might be possible to use the calculation process with Excel file only by using the macro manually, but managing process globally would be challenging. The Excel file would need to be updated into global server, where every necessary person would have access; the update process would be difficult as the maintenance can be done only by one person at the same time.

By taking these factors into consideration, it is quite clear that the best way would be to build the new tool with automation. Next steps in the process would be to present the concept and proposed system solution for Business and IT stakeholders, estimate the costs for the development, analyze the business case again and calculate the possible business benefits and analyze this further

with to see that would there be a potential business case if this kind of tool and process would be developed.

Also it might be beneficial for the company to expand the minimum order quantity calculation process for small products as mentioned earlier. Small products are currently out of scope, but based on received feedback, business and factories might be interested on the guidelines and implementation.

Also there might be something that could be enhanced within Online tool. The new solution would replicate the minimum order quantity to Online tool, but based on the result of the study, it might make sense to have check points for the ordering quantities, not only compared to the minimum order quantity from material master data, but also to the quantity related to the master carton sizes or pallet sizes.

The study and writing process has been very interesting learning opportunity. Even though I have been working several years in case company, I have had chance to learn new things while writing this document and I think that it is very important to have personal growth in the work.

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